Nematology Circular No. 38
April 1978

Fla. Dept. of Agric. & Consumer Services
Division of Plant Industry

HETERODERA SCHACHTII, A. SCHMIDT, 1871 (T.), (SUGARBEET NEMATODE) A SEVERE PEST OF CABBAGE IN FLORIDA.

R. P. ESSER AND H. L. RHOADES[1]

History: In 1859 Schacht published the first occurrence of this pest in Germany. In 1969 the pest was detected in Florida on cabbage (Brassica oleracea L., Capitata group) by Dr. H. L. Rhoades.

Regulatory Status: Rule Chapter 5B-39 (5-1-1973) of the Florida Administrative Code contains the rules established to prevent spread of sugarbeet nematodes in Florida. This pest threatens all cabbage-growing areas in the state. It is extremely important to prevent its spread into cabbage-growing sites where it does not occur.

Economic Importance: Heavy infestations of this pest can produce crop failure in cabbage plantings. Heavily damaged fields will not support a cabbage crop in subsequent years if control measures are not instituted.

Geographic Distribution: The pest has been reported in cabbage from the states of California, Florida, and New York. It has also been reported from England, Germany, Canada, Poland, and Senegal.

Host List: This pest reproduces on a large number of cultivated and noncultivated plants. Common hosts include: Apium graveolens L. (celery), Beta vulgaris L. (garden beet), Brassica oleracea L. (all varieties), Ipomoea batatas Lam. (sweet potato), Raphanus sativus L. (radish), and Spinacia oleracea L. (spinach).

Symptoms: Aboveground; cabbage plants become severely stunted and unthrifty (fig. 1-A). Some plants die, resulting in poor stands (fig. 1-B). Roots; the root system is considerably reduced (fig. 1-A). White, tan to dark brown cysts can be seen with a hand lens on the roots (fig. 1-C).

Pathogenicity: Six weeks after adding 9,772 eggs and larvae to cabbage seeded in 10 cm pots, plants were stunted, chlorotic, dead, and dying.

Host Parasite Relationship: Larvae enter the roots and feed in the stele area. Giant cells form at the feeding site. The developing female swells and ruptures the root so that only the head and neck are inserted in the root tissue (fig. 1-D).

Life Cycle (sugarbeet): The second stage larva enters the root and molts in about 7 days. Approximately 4 days later the third molt occurs, and the larva is slightly swollen. About 15-16 days after entry, the fourth molt occurs, and the body is a fully swollen lemon shape. Eggs are produced 25-26 days after entry. About 10 days later the egg-filled female body (80-650 eggs) turns brown, forming a cyst. Five generations are produced per season in California.

Depth: Most cysts occur to a depth of 10-20 cm deep in the soil. The maximum depth at which cysts have been found is 140 cm.

Longevity: It is doubtful if larvae can persist more than a year free in the soil. Larvae in cysts survive about 6 years (maximum--15 years).

Temperature: Optimum temperature for growth and development of the nematode is 21-27 C. Activity decreases above 39 C and below 10 C.

Dissemination: The nematode has a natural migration rate in soil of 15-25 meters per year. One of the chief means of dispersal is water. Heavy rains, irrigation water, and stream flooding all serve to disperse the cysts into new areas. Cysts are also dispersed by infested transplants, wind, animals, man, and vehicles.

Soil: Sand, clay, muck, and peat have all supported the pest. Sand is preferred, while silt and clay are least preferred.

Preventive Measures: Every effort should be made by growers to prevent the introduction of this pest into uninfested areas. Infected cabbage transplants are the principal means by which an uninfested site becomes infested. Contaminated vehicles and footwear can also be a prime source of dissemination. Once a site is infested the pest is extremely difficult, if not impossible, to eliminate.

Contribution No. 180, Bureau of Nematology, P. O. Box 1269, Gainesville, FL 32602
1/ Nematologist, Central Fla. Expt. Sta., Sanford, FL

Control: Control is normally achieved by crop rotation/or nematocides. Crop rotation alone requires at least 3-4 years of non-host crops in California. In Florida good control has been obtained by growing one nonhost crop (cucumbers) between cabbage crops plus an overall application of 5-6 pounds a.i./acre (5.7-6.8 kg/hectare) of the organic phosphate nematocide ethoprop or 25 gal/acre (235 liters/hectare) of the soil fumigant DD.

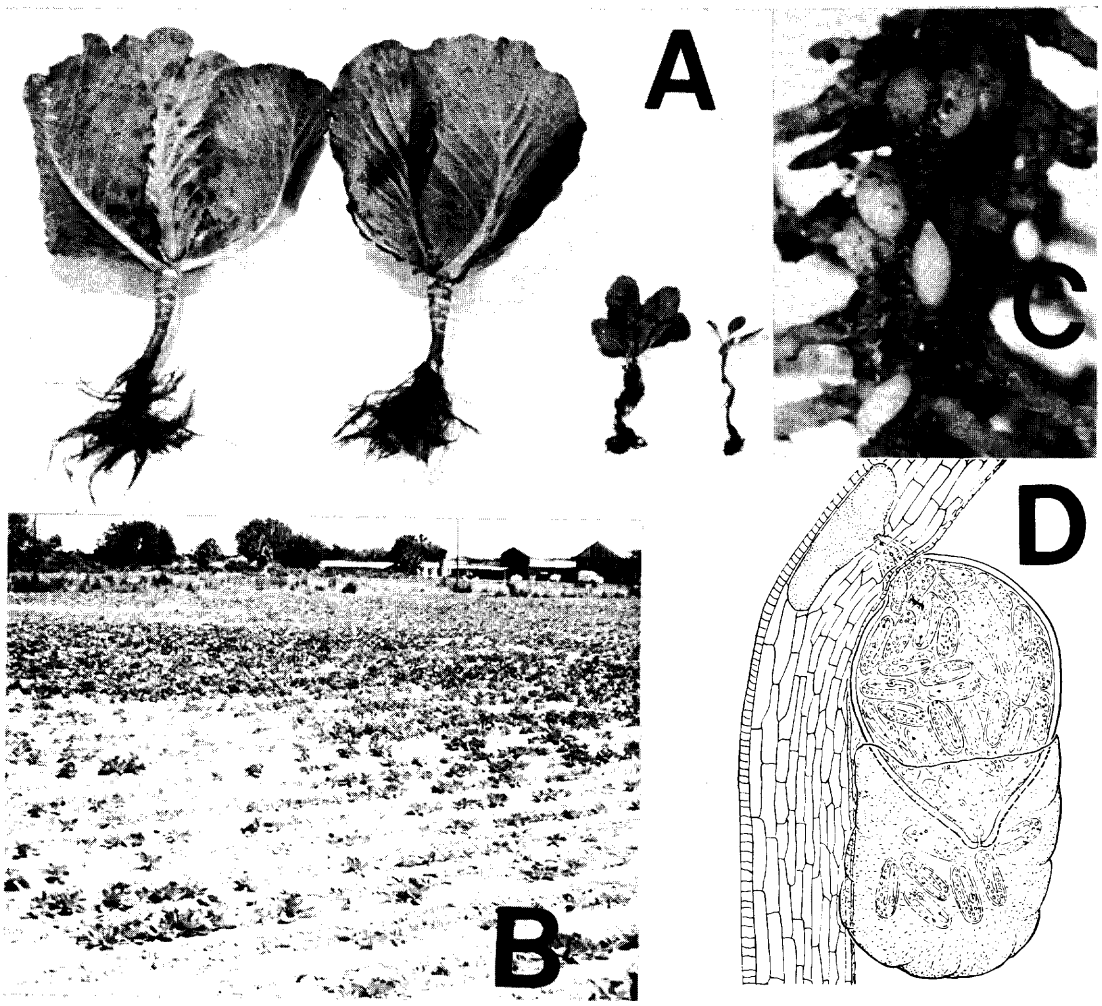

Fig. 1: A. Left: healthy cabbage. Right: cabbage plants infected with H. schachtii. B. Field symptoms of H. schachtii. C. Females protruding from cabbage roots. D. H. schachtii egg-filled female feeding in a root (after Thorne).

References:

Filipjev, I. N., and J. H. Schuurmans Stekhoven, Jr. 1941. A manual of agricultural helminthology. Brill, Leiden. 878p.

Lear, B., S. T. Miyagawa, D. E. Johnson, and C. B. Arlee, Jr. 1966. The sugar beet nematode associated with reduced yields of cauliflower and other vegetable crops. Plant Dis. Reptr., 50:611-612.

Radewald, J. D., B. J. Hall, F. Shibuya, and J. Nelson. 1971. Results of preplant fumigation trial for control of sugarbeet nematode on cabbage. Plant Dis. Reptr., 55:841-845.

Raski, D. J. 1950. The life history and morphology of the sugar beet nematode, Heterodera schachtii, Schmidt. Phytopathology 40:135-152.

_____, and R. T. Johnson. 1959. Temperature and activity of the sugar-beet nematode as related to sugar-beet production. Nematologica 4:136-141.

Rhoades, H. L. 1972. Pathogenicity and control of a Florida population of sugarbeet nematode, Heterodera schachtii, on cabbage. Proc. Fla. State Hort. Soc. 84:139-142.

Thomason, Ivan J., and Don Fife. 1962. The effect of temperature on development and survival of Heterodera schachtii, Schm. Nematologica 7:139-145.